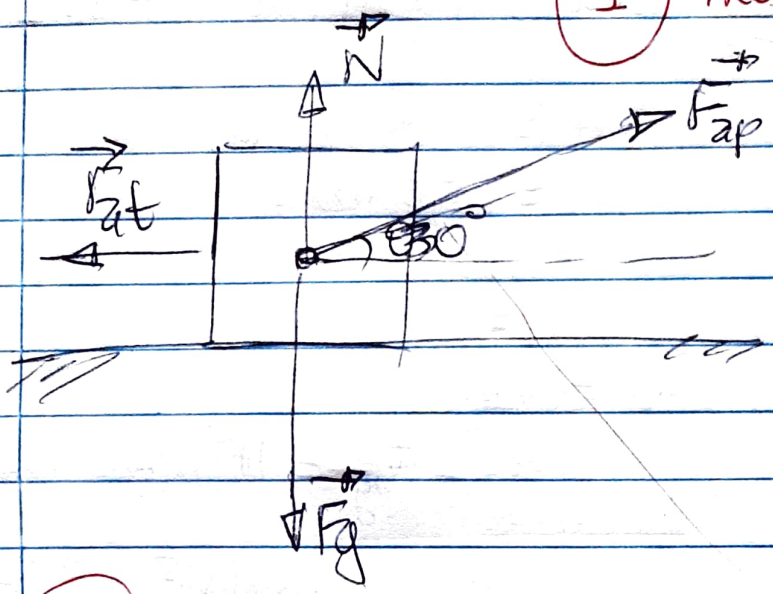
1 PROVA 3



$F_{ap} = 20,0\ N$
$F_{at} = 14,0\ N$
$\Delta S = 3,00\ m$

A $W_{F_g} = W_N = 0$

$W_{F_{ap}} = |\vec{F}_{ap}| \cdot |\vec{\Delta S}| \cdot \cos 30°$
$= (20,0) \cdot (3,00) \cdot 0,866 = 51,96\ J$

$W_{F_{at}} = |\vec{F}_{at}| \cdot |\vec{\Delta S}| \cdot \cos 180°$
$= (14,0) \cdot (3,00) \cdot (-1) = -42,0\ J$

$W_{total} = (51,96 - 42,0) = 10,04\ J$ ou $9,96\ J$

B $\Delta E_c = W = 10,04\ J$

$\Delta E_c = \frac{1}{2} m (v_f^2 - v_i^2)$

$10,04 = \frac{1}{2} \cdot 10,0 \cdot (v_f^2 - 0^2)$

$10,04 = 5,0\ v_f^2 \Rightarrow v_f^2 = 2,008$

$v_f = 1,42\ m/s$

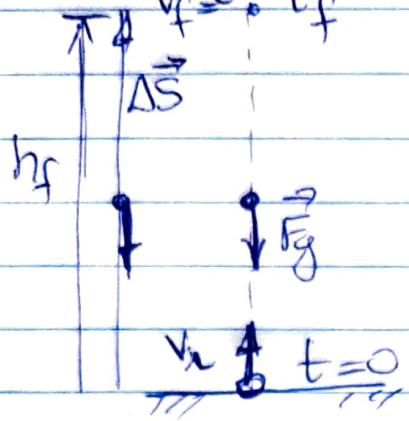
(2) Prova 3 ; E. civil , Fís. 1

(A) dados: lançamento vertical para cima.

$v_i = 126{,}0\ km/h = 35{,}0\ m/s$

$h_f = ?$

solução:



$$W = \Delta E_c$$

$$\begin{cases} W = W_{Fg} = |\vec{F}| \cdot |\Delta S| \cdot \cos 180° \\ \Delta E_c = \frac{1}{2} m (v_f^2 - v_i^2) \end{cases}$$

$$|\vec{F}_g| \cdot |\Delta\vec{S}| \cdot \cos 180° = \frac{1}{2} m (v_f^2 - v_i^2)$$

$$(m \cdot g) \cdot h_f \cdot (-1) = \frac{1}{2} \cdot m \cdot (0 - v_i^2)$$

$$-mgh_f = -\frac{1}{2} m v_i^2$$

$$gh_f = \frac{1}{2} v_i^2 \Rightarrow v_i^2 = 2gh_f$$

$$h_f = \frac{v_i^2}{2g} = \frac{(35{,}0)^2}{2 \cdot 9{,}80}$$

$$\boxed{h_f = 62{,}5\ m}$$

(B) Conservação da energia mecânica:

$$E_{mec_f} = E_{mec,i}$$

$$U_{gf} + E_{cf} = E_{ci} + U_{gi}$$

$$mgh_f + \frac{1}{2} m v_f^2 = \frac{1}{2} m v_i^2 + mgh_i$$

$$9{,}8 \cdot h_f + \frac{1}{2} \cdot 0^2 = \frac{1}{2} \cdot (35{,}0)^2 + 9{,}8 \cdot 0$$

$$h_f = \frac{(35{,}0)^2}{2 \cdot 9{,}8} \Rightarrow \boxed{h_f = 62{,}5\ m}$$

3

A

A.1

$$E_{c,f} = U_{g,i}$$

$$\frac{1}{2} m v_f^2 = mgh_i$$

$$\frac{1}{2} v_f^2 = 9{,}80 \cdot 1{,}50 \Rightarrow v_f^2 = 2 \cdot 9{,}80 \cdot 1{,}50 = 29{,}4$$

$$\boxed{v_f = 5{,}42 \text{ m/s}}$$ na posição mais baixa

A.2

$$U_{gf} = E_{ci}$$

$$mgh_f = \frac{1}{2} m v_i^2$$

$$9{,}8 \cdot h_f = \frac{1}{2} (5{,}42)^2 =$$

$$h_f = \frac{29{,}4}{2 \cdot 9{,}8} \Rightarrow \boxed{h_f = 1{,}50 \text{ m}}$$

3

B.1

$0,85 . E_{mec,i} = E_{mec,f}$

$0,85 . (U_{g,i} + E_{c,i}) = U_{g,f}$

$0,85 . \left(mgh_i + \frac{1}{2} m v_i^2\right) = mgh_f + \frac{1}{2} m v_f^2$

$0,85 \left(gh_i + \frac{1}{2} v_i^2\right) = gh_f + \frac{1}{2} v_f^2$

$0,85 . \left(9,8 . 1,5 + \frac{1}{2} . 1,00^2\right) = 9,8 . 0 + \frac{1}{2} v_f^2$

$0,85 (14,7 + 0,5) = \frac{1}{2} v_f^2$

$0,85 . 15,2 = \frac{1}{2} v_f^2$

$(12,92) \times 2 = v_f^2 \Rightarrow v_f^2 = 25,84$

$\boxed{v_f = 5,08 \text{ m/s}}$

B.2

$0,85 E_{mec,i} = E_{mec,f}$

$0,85 . \frac{1}{2} m v_i^2 = mgh_f$

$0,85 . \frac{1}{2} . (25,84) = 9,8 . h_f$

$\frac{10,982}{9,8} = h_f$

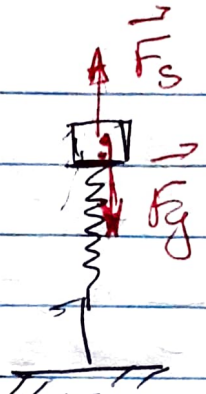
$\boxed{h_f = 1,12 . m}$

4

A) dados:

$m = 8{,}00\ kg$

$x = 10{,}0\ cm$



no equilíbrio: $F_s = F_g$

$kx = mg$

$k = \frac{mg}{x}$

$k = \frac{8{,}00 \cdot 9{,}80}{0{,}100\ m} = \frac{78{,}4\ N}{0{,}100\ m}$

$\boxed{k = 784\ N/m}$

B) $U_{elast} = \frac{1}{2} kx^2 = \frac{1}{2}(7{,}84 \cdot 10^2) \cdot (0{,}100)^2 = \frac{7{,}84}{2} \cdot 10^2 \cdot 10^{-2}$

$\boxed{U_{elast} = 3{,}92\ J}$

para $x = (0{,}10 + 0{,}30)\ m = 0{,}400\ m$

$U_{elast} = \frac{1}{2}(7{,}84 \cdot 10^2) \cdot (0{,}400)^2 = 62{,}72\ J$

(B) $U_{elast} = \frac{1}{2} k x^2 = \frac{1}{2} (7{,}84 \cdot 10^2) \cdot (0{,}100)^2 = \frac{7{,}84}{2} \cdot 10^2 \cdot 10^{-2}$

$$\boxed{U_{elast} = 3{,}92\ J}$$

para $x = (0{,}10 + 0{,}30)\ m = 0{,}400\ m$

$$U_{elast} = \frac{1}{2} (7{,}84 \cdot 10^2) \cdot (0{,}400)^2 = 62{,}72\ J$$

(C) $U_{gf} = U_{elast,\,i}$

$$mgh_f = \frac{1}{2} k x_i^2 \Rightarrow (8{,}00) \cdot (9{,}80) \cdot h_f = 62{,}72$$

$$h_f = \frac{62{,}72}{78{,}4} = 0{,}800\ m$$

$$\boxed{h_f = 0{,}800\ m}$$

(D) $E_{cf} = U_{elast,\,i}$

$$\frac{1}{2} m v_f^2 = 62{,}72 \Rightarrow \frac{1}{2} \cdot (8{,}00) \cdot v_f^2 = 62{,}72$$

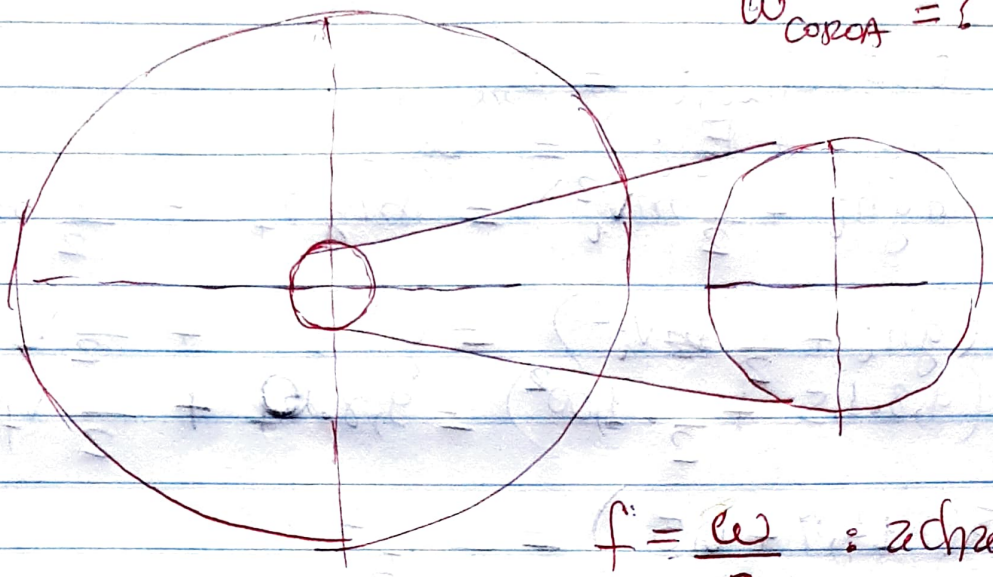
$$v_f^2 = \frac{62{,}72}{4} = 15{,}68$$

$$\boxed{v_f = 3{,}96\ m/s}$$

DATAPEL

(5)

$\omega_{COROA} = ?$



$$\begin{cases} V = \omega R \\ \omega = \frac{V}{R} \end{cases}$$

$V_{roda} = 8{,}00\ m/s$

$f = \frac{\omega}{2\pi}$: achar ω_{COROA}

$\omega_{rod} = \omega_{catraca}$

$\frac{V_{roda}}{R_{roda}} = \frac{V_{catraca}}{R_{catraca}}$

$\frac{8{,}00}{0{,}50} = \frac{V_{catraca}}{0{,}025}$

$V_{catraca} = \frac{8{,}00}{0{,}500} \cdot 0{,}025$

$V_{catraca} = 0{,}40\ m/s$

$V_{COROA} = V_{catraca}$

$\omega_{COROA} \cdot R_{COROA} = V_{catraca}$

$\omega_{COROA} \cdot 0{,}100 = 0{,}400$

$\omega_{COROA} = \frac{0{,}400}{0{,}100}$

$\omega_{COROA} = 4{,}00\ rad/s$

$f_{COROA} = \frac{\omega_{COROA}}{2\pi} = \frac{4}{2\pi} = \frac{2}{\pi}$

$f_{COROA} = 0{,}6366\ Hz$

$f_{COROA} = 0{,}6366$ voltas/s

$\cong 38{,}2$ rpm

(6) Prova 3 (Fis 1 – E. Civil)

(A) **dados:** $P = 3000\,W$

$\Delta t = (10{,}0\,min) \times (5 \text{ vezes por dia})$

ΔE : energia dissipada $= ?$

solução:

$$P = \frac{\Delta E}{\Delta t} \Rightarrow \Delta E = P.\Delta t$$

$$\Delta t = (10{,}0\,min) \times 5 \times 30 \text{ dias} = 1500\,min$$

$$\Delta t = (1{,}500 \cdot 10^3)\,min \times \frac{60\,s}{min} = 9{,}0 \times 10^4\,s$$

$$\Delta E = (3{,}000 \cdot 10^3\,J) \times (9{,}000 \times 10^4\,s)$$

$$\Delta E = 27 \cdot 10^7\,J$$

$$\Delta E = 270 \cdot 10^6\,J$$

$$\begin{cases} 270 \cdot 10^6\,J \text{ — } x\,kwh \\ 3{,}6 \cdot 10^6\,J \text{ — } 1\,kwh \end{cases}$$

$$x = \frac{270 \cdot 10^6}{3{,}60 \cdot 10^6}$$

$$x = 75{,}0\,kwh$$

$270 \cdot 10^6\,J = 75{,}0\,kwh$

(B)

$$18\,000\,\frac{BTU}{h} = 18 \cdot 10^3\,\frac{BTU}{h} \cdot \frac{1055\,J}{1\,BTU} \cdot \frac{1\,h}{3600\,s}$$

$$= \frac{(18 \cdot 10^3) \cdot (1{,}055 \cdot 10^3)}{3{,}6 \cdot 10^3}\,\frac{J}{s}$$

$$= \frac{19{,}0 \cdot 10^6}{3{,}6 \cdot 10^3}\,J/s = 5{,}278 \cdot 10^3\,W$$

ou

$$18\,000\,\frac{BTU}{h} = 18000 \cdot \frac{1055\,J}{3600\,s} = 5278\,W$$